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ABSTRACT

This unit provides a number of activities for students in grades 6-8. Emphasis is on the use of marine organisms and the marine environment by American Indians. While many of the examples relate to the Middle Atlantic Coast, they could be adapted to other areas of the country. Included in the document are evaluation materials and student references. (RH)

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UTILIZATION OF ESTUARINE ORGANISMS BY THE INDIANS

A Learning Experience for
Coastal and Oceanic
Awareness Studies

Produced by

MARINE ENVIRONMENT CURRICULUM STUDY
MARINE ADVISORY SERVICE
UNIVERSITY OF DELAWARE

and

POPULATION-ENVIRONMENT CURRICULUM STUDY
COLLEGE OF EDUCATION
UNIVERSITY OF DELAWARE

as part of a

PLAN FOR ENVIRONMENTAL EDUCATION

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Please send evaluations

of learning experiences

to

Dr. Robert W. Stegner, Director

COAST Project

310 Willard Hall Education Building

University of Delaware

Newark, Delaware 19711

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TITLE: UTILIZATION OF ESTUARINE ORGANISMS BY THE INDIANS

* CONCEPT: III.A.1.

III. The natural system influences the evolution of human culture.

A. Stable human communities tended to form in river regions with plentiful water, temperate climate, and fertile soils.

1. THE FLORA AND FAUNA OF FERTILE FLOOD PLAINS ATTRACTED HUMAN SETTLEMENT.

** MARINE CONCEPT: 4.12

4. Man is part of the marine ecosystem.

4.1 The marine environment has affected the course of history and the development of human cultures.

4.12 PROXIMITY TO THE OCEANS AND THE AVAILABILITY OF MARINE RESOURCES HAVE INFLUENCED THE CULTURES OF MANY SOCIETIES.

GRADE LEVEL: 6-8

SUBJECT: Social Studies

CLASS PERIODS: Various

AUTHOR: Thomas

* From A Conceptual Scheme for Population-Environment Studies, 1973. Cost $2.50.

** From Marine Environment Proposed Conceptual Scheme, 1973. No charge.

Both conceptual schemes are available from Robert W. Stegner, Population-Environment Curriculum Study, 310 Willard Hall, University of Delaware, Newark, DE 19711.

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GENERAL OBJECTIVES

At the conclusion of this unit, the student will be able to:

1. Describe typical ecological communities found in the estuarine environment of the Middle Atlantic Coast.
2. Relate what organisms are found in a particular community.
3. Describe how man in his primitive state developed methods of successfully exploiting the estuarine environment for his basic needs.
4. Describe how primitive man prepared and preserved his foodstuffs.
5. List ways primitive man used plant materials in building and manufacturing conveniences for himself.
6. Describe how simple shell objects were used according to their shape and form.
7. Describe how shells were greatly modified in different ways to produce tools, utensils and ornaments.
8. List various shells and foods which were suitable trade items for primitive peoples who lived in the interior of North America.

PRE-TEST

1. Give the names of four types of areas found in an estuarine environment.

2. Name five methods primitive man could have used to catch fish.

3. What are "spawning beds"?

4. Give four uses of discarded shell by primitive man.

5. What is the difference between a spear and a harpoon?

6. What is "wampum" and what was it used for?

7. Describe how you would catch fish in a shallow tidal stream using marshgrass and poles.

8. How would you boil water in an earthenware pot by using stones and a fire? (Note: pot is not over the fire.)

9. How could you preserve fish and crustaceans for storage if you were an American Indian in 1491?

10. Out of what materials could you make fish hooks if you were an Indian in the year 1491?

OUTLINE OF UNIT

I. Introduction
- A. Man, his needs, and the estuarine environment.
- B. Ecology of area to be studied
  1. Tidal rivers
  2. Marshes
  3. Mud flats
  4. Bay
  5. Dunes
  6. Beaches
  7. Intertidal zones
  8. Ocean
- C. The time span of our study - prehistory chart (Slide 64)

II. Types of Organisms Primitive Man Sought in These Communities
- A. Fishes
- B. Sea Mammals
- C. Crustaceans
- D. Mollusks
- E. Plants

III. Methods of Acquisition
- A. Fishing methods
  1. Angling
  2. Net types
     a. simple hand nets
     b. dip net
     c. scoop nets
     d. gill nets
     e. seine
     f. crude "bush-net"
  3. Hand snare
  4. Weirs
  5. Traps
  6. Fish rake
  7. Stick and feet
  8. Bow and arrow
  9. Spears (simple & harpoon; atlatl)
  10. Set-lines
  11. Poisoning
  12. Use of canoe
  13. Trolling
- B. Catching crustaceans
- C. Gathering mollusks
- D. Collecting plants (See IV B)

IV. Food Preparation and Preservation
- A. Animal foods
  1. Food eaten immediately
     a. stone-boiling
     b. steaming with heated stones
     c. steaming under fire
     d. roasting and broiling
     e. partial decaying
     f. pulverization
     g. shredding, baking, frying, and smoking

2. Preservation
   a. drying
   b. smoking

B. Plant foods
   1. Seaweeds and uses
   2. Marsh plants and uses

V. Use of Marine Fringe Plants as Building Materials
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      4. knives and scrapers
      5. celts
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      8. weapons
      9. tweezers
      10. rattles
      11. "temper" for pottery

   B. Ornamentation
      1. pins
      2. beads; wampum
      3. pendants and gorgets
      4. tablets; facial effigies
      5. fossil shells
      6. pearls

   C. Trade Items

VII. Summary

I. Introduction

Behavioral Objectives

1. Student will be able to describe the principal communities of an estuarine environment.

2. Student will be able to name various periods of time during which primitive man utilized the resources of the estuarine environment in the Mid-Atlantic coastal area.

Background Information

In primitive man's never-ending quest for food, good hunting areas were found along the coast. The ocean, bays and tidal rivers abounded with aquatic life. Plants and animals suitable as food could be found in the intertidal zones and along the sandy beaches. Vast salt meadows and mud flats supplied more organisms for his daily needs. Softwoods were readily available for building dugout canoes, thus permitting him to venture farther out into the waters in search of foods. Even his dwellings and conveniences inside could be constructed from the tall grasses of the marsh. The methods of acquiring food, preparing and preserving it and the use of shells and marsh plants for a variety of purposes reflect the cleverness of primitive man and his ability to capitalize on his immediate environment to a great extent.

Class Activities

Slides 60 through 63 combined with lecture can lead the class through the area of our country that is to be considered in our study of the various communities typically found in an estuarine environment.

Student activities could include making several more charts showing the various communities found in an estuarine environment. These can be used later in the unit.

The Time Span of this Study :

Slide 64 shows the several stages of primitive man's progress beginning at 14,000 B. P.* to the historic period marked by contact with the Europeans. A group of students could duplicate this chart for classroom display.

*B. P. = Before Present

II. Types of Organisms Primitive Man Sought in These Communities

Behavioral Objectives:

1. The student will be able to list some of the principal animals and plants that primitive people sought.
2. The student will be able to list the ecological areas in which these animals and plants could be found.

Background Information

C. C. Hall 1635 - "The Sea, the Bayes of Chesapeake, and Delaware, and generally all the Rivers, doe abound with Fish of several sorts; for many of them we have no English names; There are Whales, Sturgeons very large and good, and in great abundance; Grampuses, Porpuses, Mullets, Trouts, Soules, Place, Mackerell, Perch, Crabs, Oysters, Cockles and Mussels; But above all these, the fish that have no English names, are the best except the Sturgeon: There is also a fish like the Thornebacke in England, which hath a taile a yard long, wherein are sharpe prickles, with which if it strike a man, it will put him to much pain and torment, but it is very good meat; also the Tode-fish, which will swell till it be ready to burst, if it be taken out of the water."

DeVries 1632-1644-on fish-"The river has a great plenty of fish, the perch, roach, pike, sturgeon, and similar fish. Along the sea-coast are codfish... (at mouth of river) we fished once with our seines, and caught in one draught as many as thirty men could eat of perch, roach, and pike...."

DeVries - on whales - "...to settle our colony upon South River, which lies in the 38th and 1/2 degree, and to conduct the whale fishery there, as Godyn represented that there were many whales which kept before the bay....

.....saw a whale at mouth of South River.....

.....We were surprised to see a whale seven or eight miles up into fresh water.....

.....whaling season - December to March."

In the estuarine environment primitive peoples could find many types of plants and animals upon which they could base their survival. Each particular estuarine community produced its own characteristic organisms, and man soon learned their habits, where to find them, and how to catch or gather them.

The following are only partial lists of some of the known animals and plants that were used as food by primitive man in the Mid-Atlantic coastal area. These lists were compiled from books, journals and historical documents. Also, no reference will be made to the many types of marshland mammals and birds that were a part of the estuarine communities and therefore sources of food for man.

ORGANISMS USED AS FOOD BY PRIMITIVE MAN IN MID-ATLANTIC COASTAL AREAS

A. Fishes

herring
shad
sturgeon
rockfish
suckers
sea perch
drum
roach
gar
catfish
eels
carp
yellow catfish
alewife
sea bass
weakfish
mummichog
mullet
sea trout
mackerel
toadfish
cod
pike
skates
sharks
flounder

B. Sea Mammals

whales
porpoises
seals

C. Crustaceans

crabs
lobsters
crawfish
shrimp
prawns

D. Molluscs

oysters
scallops
whelks
periwinkles
clams
cockles
mussels

E. Plants

Seaweeds
Arrow arum, or Green arrow
Arrow-head, Duck potato, or Wapatoo
Arrow-leaved Tear Thumb
Narrow-leaved Cat-tail
Golden Club
Marsh Marigold
Swamp Milkweed
Pickerel-weed
Pondweeds
Sweet Flag
Yellow-Water Lily, or Hog Lily

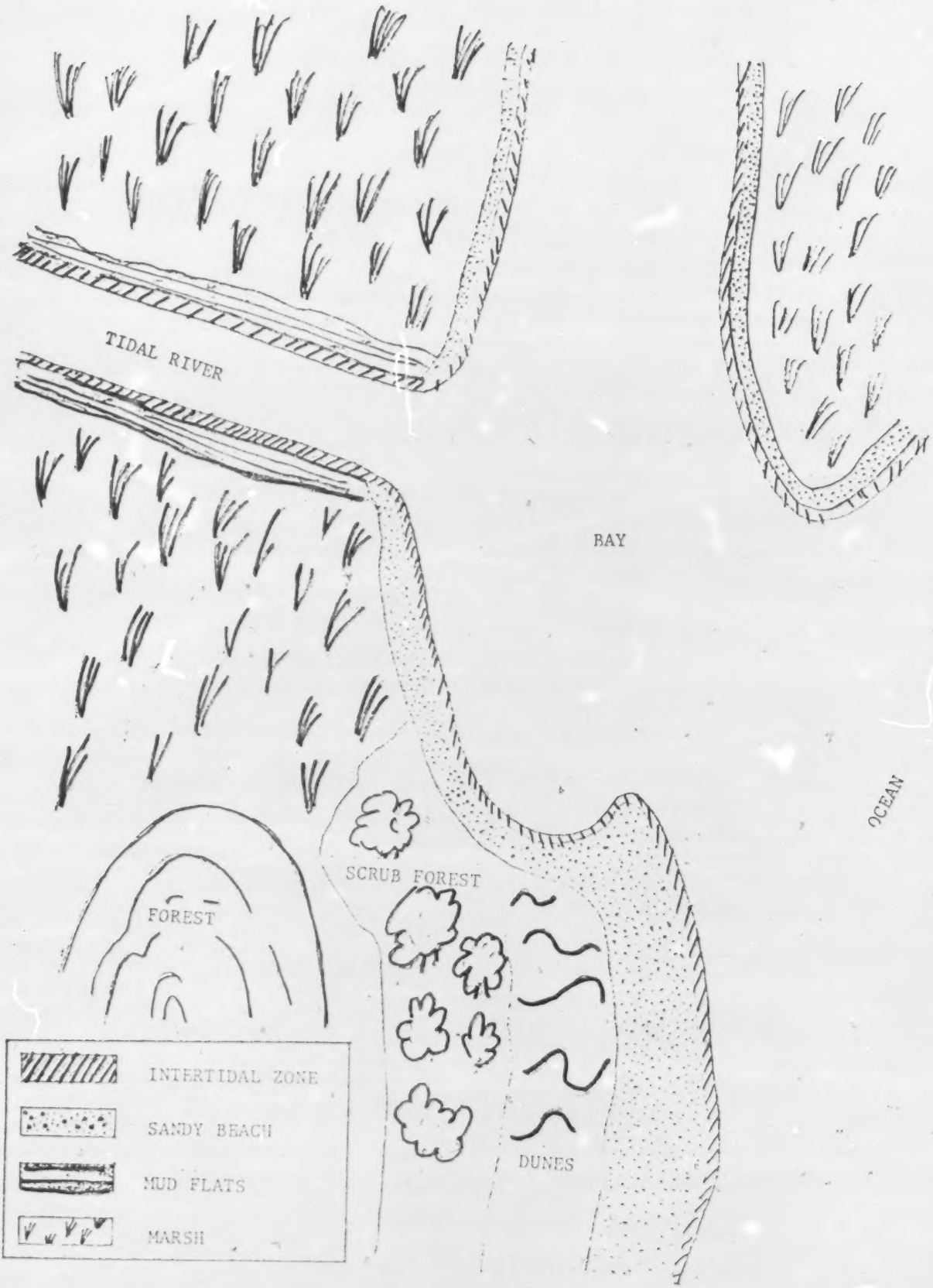
Class Activities:

Student activities can include placing the food types (printed on individual cards) under the proper community (-ies) found on the poster chart which depicts a typical estuary. Additional food type cards can easily be made if needed. Additional estuarine charts made in Section I can be used here. One model chart follows (p. 11A). This should be enlarged on standard poster board, perhaps by one or more students, in color. The food type cards (and the fishing method cards to be used in section III) can also be made up by students following the list on page 11B . The teacher-author found that cards 1" by 2" work well.

Necessary information which the students will want in order to do the above activity can be obtained from the following handbooks:*

1. Fishes
2. Seashells of the World
3. Seashores

*See Student References at end of unit for information on handbooks.


TIDAL RIVER
BAY
OCEAN
SCRUB FOREST
FOREST
DUNES
INTERTIDAL ZONE
SANDY BEACH
MUD FLATS
MARSH

Card labels for the student activities of Section II and Section III:

FOOD TYPES

fish spawn
mackerel
alewife
carp
eel
mummichog
herring
roach
codfish
pike
perch
sturgeon
drum
sucker
rockfish
shad
catfish
gar
crab
shrimp
lobster
prawn
periwinkle
cockles
scallop
whelk
mussel
clam
quahog
oyster
seal
whale
porpoise
turtle
shark

FISHING METHODS

fish weir
seine
bush-net
gill net
scoop net
dip net
trolling
angling
flares
canoe
poisons
set-lines
harpoon
simple spears
bow and arrow
stick
fish rake
tidal trap
trap

MAKE THREE OF EACH LABEL

III. Methods of Acquisition

Behavioral Objectives:

1. The student will be able to describe what fishing methods were used in certain local geographical situations.
2. The student will make several types of fishing apparatus.
3. The student will be able to describe where and how crustaceans and mollusks were gathered.

Background Information

A. Fishing Methods

The abundance and scarcity of fish along the Atlantic Coast depended on the season of the year. In the spring, fish appeared in vast shoals in "spawning beds", along the coast and in the bays and rivers. Sturgeon, shad, and herring were numerous then. Captain John Smith in his History of Virginia in the 17th century, related that the fish were so plentiful in the Potomac River they hindered the landing of the boat.

A variety of methods were used by primitive man in catching fish, sharks and some marine mammals. The following methods were compiled from several books, journals and historical documents.

1) Angling - a baited hook of some type was tied to a hand line and trolled from a bank or a canoe. The type of fish hook depended on the habits of the different species of fish. Materials used for hooks were bone, wood, shell, stone or copper. Along the Atlantic Coast, a J-shaped hook - well-made and barbed - was generally used. Lures and sinkers, made of stone or pieces of pottery, were no doubt used. Historians have also noted that Indians fishing off a sandbar preferred the lee side of the sandbar.

2) Nets - were used by primitive people who counted on fishing to produce a large proportion of their diet. Nets required time and effort in making and maintaining ;however, they were the most efficient means of catching fish in large quantities. A variety of nets were used and the twine used depended upon the locality.

a). dip net - consisted of a bag-shaped net attached to a wooden frame. These were coarsely or finely woven depending on the size of fish sought.

b). gill nets - were woven in such a manner as to let the fish's head pass through the net and then catch the fish behind the head at the gills. These nets were often very long and had wooden floats along the top. Sinkers were placed on the bottom of the net to keep it at the proper depth in the water.

c). "bush nets" - these were crudely made from willow, or grapevine, fibers or twines. These were set at the entrance of smaller creeks branching from main tidal streams. Barriers of poles several feet apart were driven upright into the mud at low tide. The lattice work sloped upstream. The top was low enough so fish could pass over the top at high tide, however, at ebb tide the fish would be barred from returning to the main tidewater river. In the enclosures where water might be six to eight feet deep hunters would shoot the trapped fish with an arrow or spear. Sturgeon were often trapped in this manner.

d). Seine - was a long net with wooden floats along the top and stone, shell or pottery sinkers on the bottom. Drift seines were used to catch shad. Nets were tended night and day. At night seines were provided with board floats at each end which carried torches. In doing this the position of the net was always known.

3). Hand snare - used to catch the fish's tail and suddenly tightening the noose. Often a fisherman was pulled into the water and either held on until the fish tired or else he let go of it. This method was often used to catch sturgeon.

4). Weir - a highly efficient method used all along the Atlantic Coast especially for fish which travelled in "schools". It was usually built in tidal flats or where tide action was strong. Its use was based on the idea that fish approaching the shore with the incoming tide will often swim parallel to the shore and also can be guided by any continuous obstacle in the water. Its construction involved much time and effort and required much maintenance. The traps were built from thousands of sturdy stakes driven into the muddy bottom of a river estuary in double rows to enclose an area several hundred feet in diameter. The Bolyston Street Fishweir in Boston was built about 2500 B.P. and covered two acres. Brush and flexible wickerwork was placed between the stakes. The tops of stakes usually were high enough to be seen at highest tides. Fish were diverted into the trap by straight "leaders" also of wickerwork. Some "leaders" were V-shaped and led directly to the traps mouth. The "leader" might also be perpendicular to the flow of the current. When the tide receded, the entrapped fish were gathered in nets, by clubs or spears. Fish could also be left in the traps until needed. Sturgeon and shad were caught in this manner. Captain John Smith reported 52 to 68 fish caught at once by this method. When weirs were used in deeper water they could be weighted and sunk to proper levels.

5). Fish rake - was a long flat board with sharp bone points set at an angle at its end. As men paddled through a shoal of fish, the rake was tossed and retrieved. This was commonly used in catching herring.

6). Stick - with this method parties of men waded through the water and stabbed fish with pointed sticks. Flounder was often caught in this manner, since it is a bottom dweller.

7). Bow and arrow - fish were shot with a bow and arrow trailing on a long fiber string. The "cowfish" or "stiff-backed" perch were caught in this manner. The hunter would go to a tidal pool toward evening and shoot them from the bank while the fish guarded their young.

8). Spears - these were of two types - the simple fish spear and the harpoon.

a). simple fish spears - these were poles of varying length with tips firehardened or armed with bone or antler points. They were not efficient in retrieving fish. They were useful in shallow water. Spearing often took place at night from a dugout canoe by torchlight.

b). harpoon - was a spear with a detachable head with barbed points usually made from antler or bone. A hole was drilled at the base of the head for line attachment so as to retrieve the fish.

A throwing stick, or atlatl, was sometimes used in hurling a spear or harpoon. It multiplied the arm's efficiency in hurling. The simple spear and harpoon could be used in places where a bow was not practical such as in a canoe and in the marshes.

9). Set-lines - used mainly in catching catfish. Lines of heavy cord 250-300 feet long were strung out across the water. At distances of 18 inches apart were tied hooks on string leaders 12" in length. At intervals along the set-line stone sinkers were tied. One end of the set-line was attached to a stout pole stuck into the mud bottom and the other end was at the surface tied to a float made of pine. Sinkers kept the line on the bottom where the catfish feed. The floating end allowed play for the tides. Hooks were baited with cut-up minnows and renewed every other day. The average haul was 60-100 catfish. Any mussels attached to the bait were also brought home and prepared for eating.

10). Poisoning - was a method much used by primitive peoples of the Virginia area. It was less common among other groups because the tide usually prevented formation of quiet pools of water. It was used mostly in the summer when the water was low and slow moving. Certain plants were used to make these poisons. Pounded walnut bark, certain roots (toza root); pounded buckeyes, pokeweed or saproots could be thrown into the water to stupefy the fish so they could be dipped out in baskets as they floated on the surface of the water.

11). Flare fishing - men would go out at night in canoes during low tide, accompanied with spears and torches. The light would attract the fish to the surface where they could be speared. Eels in particular were caught this way during neap tides.

12). Canoes - were an asset rather than a method of catching fish. They were hollowed out of a thick tree trunk by burning out the interior of the trunk. Charred parts were then chopped or scraped away with clam shells. Usually a single canoe could carry 10-12 men, however, it is reported larger ones carried 20-24 men. Cedar trees commonly were used in making canoes. Gum and resin were dabbed on the interior to aid in burning it out faster.

B. Catching Crustaceans

C. Gathering Mollusks

Gathering of various arthropods and mollusks occurred mainly during the summer. Because the various crabs creep, climb or burrow, they were easily caught in shallow water with a dip net or traps baited with fish heads or animal innards. Lobsters and crawfish which are creeping animals could be found on the water's bottom at depths of 10-30 feet. A baited hook, or dip hand net, was used in catching them. Shrimp and prawns living on the sea bottom could be lured to the surface by torchlight at night and caught with a hand net. Very often small crabs, shrimp and shellfish could be found in and under the coarse dark green seaweed called rockweed. Numerous species of mollusks were collected by digging for them, taking them by hand while wading, and by diving for them.

Class Activities:

Slides #65through 73 can be used in combination with lecture. Additional information concerning the slides can be found in the teacher section. Much of this section will have to be teacher lecture and inquiry with outlines and drawings of the various techniques done on the blackboard.

Slide #74, from an original water color painting done by John White in 1587, can be used as a summation of fishing methods since several are shown here. Also this slide shows typical animals and plants found in the estuarine environment. This slide could also be used as a quiz on fishing methods.

Student activities can involve placing individual fishing method cards on the estuarine charts in areas where the methods could be used profitably. These cards can also be used in conjunction with the food type cards used in Section II.

Actual experimentation can involve making the following fishing gear:

1. Fish hooks - can be made from clam or oyster shells by grinding them down to a desired shape using a sandstone cobble. The use of bone should be avoided because this would involve the use of knives for manufacturing.

2. "Bush nets"- could be made out of poles and marsh-grass and set up in an area near the school. Use Teacher Section for method.

3. Weirs and Traps - could also be done as in #2 above.

In teaching about the gathering of crustaceans and mollusks, lectures and the estuarine chart can be used. Also a field trip to a marsh and bay area nearby could involve student searches for these animals using information given to them in classroom lectures. This field trip could be used in connection with other sections of the unit.

IV. Food Preparation and Preservation

Behavioral Objectives:

1. The student will be able to describe what methods were used to prepare and preserve plants and animals for eating.

2. The student will do several experiments outdoors which involve food preparation using only natural methods.

3. The student will do a controlled experiment outdoors involving the effectiveness of smoking and drying fish as opposed to no preservation.

4. If possible the student will prepare an edible dish using a marsh plant (after it has been identified).

5. The student will learn to clean a fish using only stone tools.

Background Information

A. Animal Foods

Marine animals, seaweeds and beach and marsh plants were prepared for eating and/or storage in numerous ways by primitive peoples along the Mid-Atlantic Coast.

Fish were bled by cutting out the gills and large blood vessels lying next to the backbone. Then they were scaled with a stone or shell scraper and washed in clean water. Small fish of the herring family were eaten with a minimum of cleaning. Since the scales are loose in these fish they could be washed off immediately and easily. Such fish are quite oily but highly nutritious and were even eaten raw.

The following methods of preparation were used for various marine animals if they were to be eaten immediately.

1. Stone boiling - To make stew, food and water were placed in a vessel made of basketry. When pottery came into use this method was still used so as not to crack the pottery. Red hot stones retrieved from a fire were added until the water boiled. The boiling material was covered an hour or so with leaves until done. Various fishes were put into the broth which often included plant roots, tubers and seeds. Succotash, an original Indian dish, included fish as well as corn and beans and was made in this manner. Shad, eels, alewives, herring, and catfish were cut into pieces and boiled, bones and all, with corn and kidney beans in making a stew. Shark meat, cut into small pieces, was soaked overnight or boiled in several changes of water to rid it of the ammonia flavor which accumulates in the flesh. Then it could be added to a stew, or dealt with in other ways as described below.

2. Steaming with Heated Stones - After stones were heated in a fire, the fire was burned down to coals. Shellfish in shells were put on and in between the stones. The whole was covered with plant leaves, grass or seaweed and then a layer of sand. When thoroughly steamed in their own juices, clams, oysters and mussels would show gaping shells when uncovered.

3). Steaming under fire - A quantity of shellfish could be cooked by this method. A shallow pit was lined with leaves of plants or the food itself was wrapped in leaves. After the food was placed in the pit, it was covered with 1/4-1/2" of sand and then a fire was built on top of it. After an appropriate period of time, the ashes were raked aside and the food recovered.

4). Roasting - the fish or shellfish were coated with a layer of mud or clay. Then they were roasted directly in the fire. The mud or clay reduced loss of food by burning. In this method the fish need not be scaled for scales would be pulled off with the skin and baked clay when the food was done and ready to eat.

5). Partial decaying - various marine animals were left to partially decay and then would be used as flavoring agents for other food preparations.

6). Pulverization - the fish or shellfish could be pounded into a gruel which could be eaten immediately. When it was dried and stored for use later on, the dried material was called pemmican and was useful for long journeys. It could be mixed with berries or other fruits when eaten.

7). Shredding, baking, frying, and smoking - were other methods of food preparation used by primitive peoples in dealing with the many marine animals available.

When fish were to be preserved for eating at a later date, they were first cleaned, then washed and strung on lines over poles in the sun. Salt water was occasionally splashed on their outsides to retard spoilage. Sometimes cleaned fish and fish spawn in bowls were dried over the smoke of a fire or spread on hot rocks to dry. Drying and smoking were the most widely used preservation techniques. Herring were favorites for smoking. As an incidental note, herring which were too small to be eaten were used as fertilizer in planting corn.

Clams, oysters, mussels, crabs and lobsters were left in clean water overnight to clean themselves. If not eaten in a short time they would be wrapped in wet seaweed and packed in a basket for later use. Lobsters and crabs frequently were dried and stored in underground pits. Clams were dried for use during the winter by stringing them on sticks. Shell heaps which are deposits of refuse resulting from the "kitchen middens" attest to the tremendous consumption of shellfish by primitive peoples. These are among the most widely distributed and permanent remains of these people. They are found along the shore, tidewater bays, rivers and inlets and may cover very large areas.

B. Plant Foods

Seaweeds such as rockweed, besides being used for temporarily wrapping shellfish, were useful in another respect. After being washed in fresh water, they were dried in the sun on wood or stone, then pounded and sprinkled as seasonings over food, especially clams. Many were edible, but not in great quantities, for most are violent purgatives though they are not poisonous. They are rich in iodine, minerals, and vitamins and they help to prevent scurvy. Usually seaweed that was attached to rocks or floating free was eaten. Seaweed which contained much lime carbonate or which was slimy, horny or stranded on the beach was not eaten.

Plants growing in the marshes and along the beaches certainly provided primitive peoples with more dietary items. A few selected plants are discussed below:

1. Marsh plant called "Tuckahoe" (Orontium aquaticum or Peltandra virginica - arumlike plant). The juice of this plant is poisonous but the roots could be gathered in late summer and prepared in two easy ways. One was simply to bake the roots for 24 hours and eat them and the second was to cut the roots in slices, dry them and then crush them into a meal for baking a blackish-brown cocoa-flavored bread, called "tuckahoe bread." The dried seeds of summer and fall could be used like pepper for seasoning.

2. Arrow-Head, Duck Potato (Sagittaria latifolia) or Wapatoo.
This perennial herb was common in the marsh. Its dry tubers were used for making breadstuffs or were cooked as a starchy vegetable. Its greens could be cooked as a vegetable also. Tubers could be gathered throughout the year.

3. Arrow-leaved Tear Thumb (Polygonum sagittatum)
An annual herb which was frequent along the bays and marshes. The grains could be used in making breadstuffs during the summer and fall. During the growing season, young stems were cooked as a green vegetable.

4. Narrow-leaved Cat-tail (Typha angustifolia).
A perennial herb commonly found in marshy areas. Its pollen was used in making breadstuffs in the spring and summer. All year long the roots could be used as a starchy vegetable like the potato. During the growing season, shoots were edible as a cooked green vegetable or as salad greens. Roots were also used for making sweetners, beverages, and drinks.

5. Golden Club (Orontium aquaticum)
Another perennial herb found frequently in the upper tide zone. Its roots were cooked as potatoes are today. Dried seeds could be cooked as are starchy vegetables.

6. Marsh Marigold (Caltha palustris)
A perennial herb found in the marshes. The shoots and leaves were picked before the flowers opened. The plant had to be cooked to "kill" the poison. The leaves were also cooked as a green vegetable.

7. Swamp Milkweed (Asclepias incarnata)
A perennial herb frequently gathered in the marsh and along the bay shore. In the summer and fall the pods were cooked as a starch vegetable to get a form of okra. In the spring and summer the young shoots were taken and cooked as a green vegetable. Its flowers were sometimes pressed to get a sweetener like brown sugar.

8. Pickerel-weed (Pontederia cordata)
A perennial herb common in the marsh. In the spring and summer young stems and leaves were cooked as a green vegetable. In the fall its nut-like seeds were eaten.

9. Pondweeds (Potamogeton nodasus)
(Potamogeton amplifolius)
Perennial herbs frequent in bay headwaters. Both were found associated with other floating aquatic plants in masses or washed ashore. Their roots and tubers were cooked as a starch vegetable.

10. Sweet Flag (Acorus calamus)
A perennial herb frequently found in marshes, growing in the zone between high and low tide lines. Its young shoots, during the growing season, were used like salad greens.

11. Yellow-WaterLily, Hog Lily (Nuphar advena)
A perennial herb whose seeds were used in making flour for bread or which were popped over a fire. In its growing season, the roots were cooked as a starch vegetable.

Class Activities:

Slides #75 through 78 can be used with lecture on this section of the unit.

Student activities can include the following:

1. Cleaning a fish using only stone or shell tools.

2. Experiments in an adjacent field or on a field trip could test one or two techniques in food preparation. One method which would be easy would be to boil water with only heated stones. Another could be steaming with heated stones. Fish and/or shellfish could be cooked. Roasting a fish (or shellfish) could be done also. Only natural materials should be used except for matches and a kettle.

3. A controlled experiment could be done which would test the effectiveness of smoking and drying as opposed to no preservation.

4. A marsh plant which is easily identified and edible could be prepared.

V. Use of Marine Fringe Plants as Building Materials

Behavioral Objectives:

1. The student will be able to list how marsh grass was put to a variety of uses.

2. The student will construct a mat, broom and arrow-shaft of marsh grass using natural tools and materials.

Background Information:

Marsh plants, notably the common, plentiful and widespread marsh grass (Spartina sp.) were used as basic materials in making many of primitive man's necessities as well as his conveniences. In many areas along the Eastern Shore, houses were constructed of thatches of marsh grass laid or interwoven upon poles. Marsh grass was also used extensively for weaving basketry of many shapes and sizes. Woven mats of this plant served as seats, pillows, flooring, bedding and even house siding. Fish weirs were also built of interlaced marsh grass. The hollow stems of the plant served as musical instruments and equally as well for shafts for spears and arrows. Even crude brooms could be fashioned from marsh grass or other plants found in the tidal area.

Class Activities:

Slides # 79 through 81 can be used with a lecture on this section.

Student activities can include the following:

1. Using marsh grass, students can make a woven mat.
2. A simple broom can also be made of marsh grass.
3. A marsh grass stem can be tipped with a wooden point making a simple fishing spear.

VI. Uses of Shell

Behavioral Objectives:

1. The student will be able to list a variety of objects made from shell by primitive peoples.

2. The student will make a drinking vessel and a hafted hoe from a whelk shell.

Background Information:

Primitive peoples use of shells, notably oysters, clams, mussels, scallops and whelks, can be placed into two categories: 1) implements and utensils, and 2) ornaments.

A. Implements and Utensils

1. unworked shells - whole shells or pieces of them were used for scraping and digging.

2. vessels - large whelks were used as drinking cups after the center portions were removed. Clam and scallops could be used for dishes and cups.

3. spoons - clams and mussel shells were used for these purposes.

4. knives and scrapers - pieces of shell or hafted sections of shells were used for cutting meats and other food preparation, for scraping hides and for scraping down wet pottery to give it a more even texture.

5. celts - hafted clams or whelk which were rounded into an oblong shape were used as chopping tools.

6. agricultural implements - large whelk and hard clams were hafted and used as hoes.

7. fishing needs - often pieces of shell cut into U-shapes were used in making hooks, although most were of bone. Net-sinkers could also be made from any heavy shell.

8. weapons - ground-down pieces of whelk were used in constructing arrowpoints.

9. tweezers - these could be devised by carefully grasping 2 clam shells together in such a way as to pull out hairs or foreign objects in the skin.

10. rattles - the scallops, in particular, bedause of their beauty and form were hafted together and bound to a stick and used as rattles, in festivals or other ceremonial affairs.

11. temper - was used in making pottery by some peoples. The shell kept the clay from cracking during the drying and firing process.

B. Ornamentation

The motive of personal adornment, aside from the desire to appear attractive, seems to have been to mark individual, tribal or ceremonial distinction.

1. pins - were made of whelk columella for hair ornaments and fasteners on clothing.

2. beads - were the most common ornament which ranged from small individual shells like marginella perforated and strung on a cord to large massive ones. Cylinders, disks, and spindles were cut from the valves of the quahog, or hard-shell clam, or from the columella of the whelks. Beads can be typed as being oblong massive or tubular in form.

Runtees were large flat shell discs perforated and attached as the centerpiece of necklaces. Most often they were made of the quahog clam.

Although beads were used originally as ornamentation they later became associated with wealth, then currency and lastly as records of events past and present. In 1524 Verrazono wrote...they used "roanoke" and "peake" for currency, sometimes called "wampum-peake". Roanoke was made out of conch (whelk) shell and was dark purple, while peake was white and made of cockleshell. The bits of shell were strung like beads...." The wampum of the Atlantic seaboard was chiefly of two colors, white and purple (pink to dark purple). The value of the shell beads was determined by the color and degree of finish. The concept of wampum is confusing since it was known by many names depending on locality. Likewise it could be made of various shells again depending on locality. Later the importance of wampum was completely distorted and ruined as the English and Dutch mass-produced the wampum beads. Conventionally, wampum was made from the thick purple portion of the quahog clam, Venus mercenaria, and the white portion of the whelk, often called the conch. The periwinkle was also used. Wampum is said to have had the following usages: money, intertribal messages (beads arranged on strings in particular order as to color), belts for treaties and documents, collars, necklaces, ear-pendants and bracelets. Wampum which served as documents of recorded events were kept by a wampum keeper to preserve

it and retell the history of it to his people periodically. Later under European influence it was used as payment for scalps. It should be emphasized that the utilization of shell for beads varied among the primitive peoples of the Atlantic Coast. Many groups had no wampum at all and even its usages and make-up varied from group to group and from one time period to another.

Beads could be drilled by several methods such as the hand drill, the pump drill and the disk drill. Perhaps the drilling method went something like this:

First, the shell (s) were cut and shaped with stone tools. Drilling was done by placing a bead in a vise - a partially split stick - and boring it with a tiny stone drill tied to a slim wooden shaft. Grit was often used as a cutting agent. Drilling could also be done by a worker holding a bead in one hand against the point of a drill which was rotated on his thigh by the other hand. The bead was drilled from both ends of the shell and finally met in the middle of it. The beads were frequently finished by rubbing them with fine sand and then were strung on cords of vegetal fibers or twisted sinew.

3. Pendants and engraved gorgets - were usually made of clam shells or the outer section of a whelk. Holes were drilled in the shell for threading of a cord. It is believed that many of these disc-shaped pendants were offered in religious rites. Some ranked in beauty equal to the Turquoise ornaments of the prehistoric peoples of the southwestern United States.

4. Tablets - were made from large flat shells four inches in diameter. They were engraved or etched with symbols such as - O ☆ ☾, etc.

5. Fossil shell - in some areas these were highly prized and regarded as charms and keepsakes.

6. Pearls - though a by-product of the oysters, clams and mussels, they should be mentioned. These were probably not especially sought and collected by natives, but were obtained in the course of food consumption. Though most were ruined by the heat of the fire upon cooking, some were perforated and suspended for ornamentation purposes. The records of the first Virginia colony states "...gathered together from among the savage people about five thousand pearls...."

C. Trade

It should be mentioned that shells and shell art work, as well as the food itself, could have served as valuable trade items to people of the interior. Copper and dyes, for instance, could be exchanged for the shells, shellfish food and artwork of the coastal peoples.

Class Activities:

Slides #82 through 107 can be used as lecture aids. Much lecture information can be found in the teacher section of this portion of the unit. Blackboard outlines of the uses of shell should be useful for the students in gaining a perspective on the subject.

Student activities can include the following:

1. A whelk shell can be broken in a desired manner and hafted on a stick using vine in making a hoe.

2. A whelk shell can be broken, the columella removed, and the edges ground down using a sandstone cobble in making a drinking vessel.

3. Clam shells can be used in testing their effectiveness as tweezers.

VII. Summary

The estuarine environment played an extremely important role in the aboriginal life of the middle Altantic coast. Subsistence activities were involved. Fashioned shell hoes and celts were used in agricultural activities. Shell arrowpoints were sometimes used in hunting game and fish. Fishing methods were highly developed, using man's intellect and the immediate plants in the environment for constructing nets, weirs, etc. Shells could even be offered in trade to peoples of the interior for goods rare in the estuarine area.

House structures were often made of marshgrass and other similarly large plants. Village locations were determined by their nearness to a continuous source of estuarine plant and animal life. Even the sizes of the villages and outposts were an indirect result of man's ability to catch and gather food, survive and flourish.

Religion, ceremonies and burial practices no doubt involved estuarine plants and animals to some extent. The dead were sometimes laid to rest upon mats of woven marshgrass. Shell vessels and/or woven baskets containing food accompanied the dead for use in "later life". The same articles could also be used in ceremonies. Shell beads of various sizes, shapes and colors decorated the bodies of the living as well as the dead.

An enormous variety of shell artifacts existed from simple shell scrapers to beautiful and delicate beads drilled so perfectly as to be unmatched in precision and form. After shellfish were eaten the shells themselves became dishes, cups or spoons to serve for future meals. Some of the modifications of shells were simple; others involved planning and great skill.

The social customs no doubt were affected in many ways by the environment and what it had to offer. Ornamentation, for instance, came to declare wealth or be a part of a ceremony. Later shell ornamentation gave way to articles of trade and of currency. Even political activities, such as treaty agreements, were in many cases coded by the color and form of simple shells arranged to tell a story of an event.

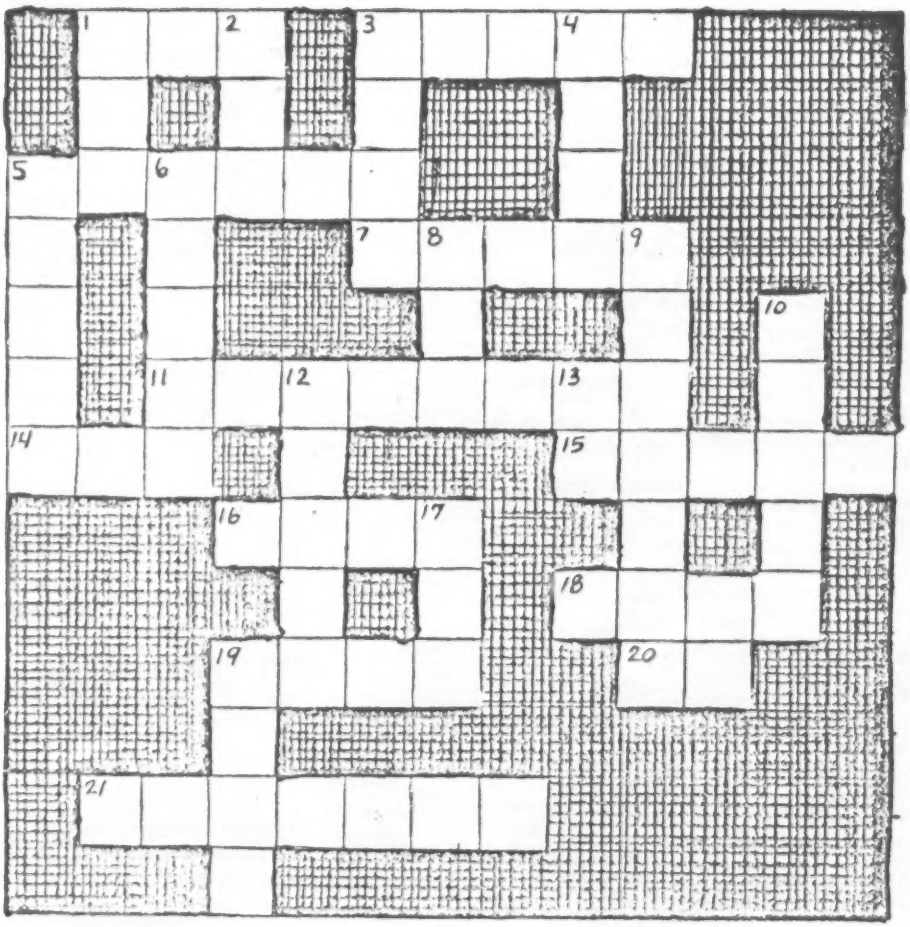
Primitive man was an inseparable part of his environment. Whatever his environment was, he quickly became part of it and used it as fully as he could for necessities like food and for his living conveniences.

Class Activities:

The students can be given the following question as an assignment. It should be termed a short composition.

Suppose you were stranded in an estuarine environment for a period of a week with nothing but a pack of matches and your own wits. How would you exist when it is necessary for you to find your own food and shelter?

CROSSWORD PUZZLE



CROSSWORD PUZZLE

ACROSS

1. Sand ___
3. Where ocean water meets land
5. A favorite food of early man
7. Sometimes used to build weirs
11. A way of catching large numbers of fish in a shallow tidal stream
14. Hand device used to capture fish along bay shallows
15. Utensil made from shell
16. Many of these were made into wampum belts
18. Material used in making fish-hooks
19. Quahog, or hard-shell ____
20. Opposite of "yes"
21. Plant used to keep clams, oysters, and mussels fresh when being transported some distance

DOWN

1. Large inlet off the ocean
2. Fish were often allowed to ___and were then used as "flavorings"
3. Something on the end of a fish hook, or harpoon, to keep fish on
4. Whelk shells were often used as these
5. Large area of saltwater
6. Marsh grass was often used in making this
8. Herring was often eaten _____.
9. Spear with a detachable, barbed head
10. One could be used as a net-sinker
12. Used by primitive man in making many objects
13. Studying __ fun!
17. A device to hold back water
19. Clawed animals often found under rockweed

CROSSWORD PUZZLE
ANSWERS

ACROSS

1. bar
3. beach
5. oyster
7. brush
11. fish weir
14. net
15. spoon
16. bead
18. bone
19. clam
20. no
21. seaweed

DOWN

1. bay
2. rot
3. barb
4. cups
5. ocean
6. shaft
8. raw
9. harpoon
10. stone
12. shell
13. is
17. dam
19. crab

POST TEST

+ = true
o = false

True/False

+ 1. Marshes are often referred to as large salt meadows.

o 2. Primitive man caught sturgeon, shad and herring mainly in the fall and winter.

+ 3. Fish hooks were made of bone, wood, shell, stone and copper.

+ 4. Nets were used by people who counted on fishing to produce a large proportion of their diet.

o 5. Bush-nets were used in deep water.

+ 6. Drift seines were often used to catch shad.

o 7. Fish weirs were used at the low water mark in river estuaries.

+ 8. The atlatl was a device used in hurling spears and harpoons greater distances with greater force.

+ 9. Set-lines were often used in catching catfish.

+ 10. Poisoning was usually done in summer when water was low and slow moving.

+ 11. Flares were used at night to attract fish to surface of water.

o 12. Crabs, lobsters and crawfish were caught mainly by weirs.

o 13. Fishes of the herring family require great effort to scale.

+ 14. Partially rotted fish were often used as flavorings.

+ 15. Catfish were often eaten in a form of stew.

o 16. Shark meat needed little preparation before eating.

+ 17. Smoking and drying were the most widely used preservation methods for fish, crabs and lobsters.

+ 18. Before being eaten, clams, oysters, mussels, crabs and lobsters could be left in clean water overnight and would clean themselves.

+ 19. Powdered seaweeds were used as seasonings.

o 20. Seaweeds were eaten by primitive peoples in great quantities.

o 21. Pendants were the most common ornament of primitive man.

o 22. Purple wampum was valued less than white wampum.

__+__ 23. Wampum often served as a document and as currency.

__o__ 24. Primitive peoples adorned themselves with many pearls from shellfish which they consumed daily.

__+__ 25. Shell was used in tempering and polishing pottery.

Match each statement in Column A with the best term in Column B. Place the letter of the answer in the space provided.

	A.	B.
h 26.	Season of year when fish appeared in large numbers in spawning beds of coast, bays and rivers	a. gill net
e 27.	Method of fishing in which baited hooks on lines were dragged through water.	b. hand snare
c 28.	A bag-shaped net attached to a wooden frame.	c. dip net
a 29.	Fishing method which let fish swim part way through net and would catch it behind head.	d. harpoon
g 30.	A type of long net with floats along the top.	e. trolling
f 31.	These were used to weigh lines and nets.	f. sinkers
b 32.	Used in snaring fish's tail.	g. seine
j 33.	Method widely used in catching fish travelling in schools.	h. spring
i 34.	A long flat board with sharp bone points set at an angle used in catching fish.	i. fish rake
d 35.	A barbed spear with a detachable head.	j. fish weir
m 36.	Were hollowed out of thick trees by burning out center.	k. marsh grass
l 37.	Plant used in temporarily wrapping shellfish for later use.	l. rockweed
k 38.	Plant widely used in building houses, fishweirs, and baskets.	m. canoes
n 39.	The hard-shelled clam.	n. quahog
		o. periwinkle

Match each statement in Column A with the best term in Column B. Place your answer in the space provided.

	A.	B.
f or d 40.	Type of large mollusk often used as a drinking vessel.	a. celt
e 41.	The central column of a whelk.	b. scraper
a 42.	A tool made of a rounded clam shell and used for chopping.	c. whelk
b 43.	Tool often used in preparing hides and food.	d. *Venus mercenaria*
f or d 44.	Purple wampum was made from this animal.	e. columella
d 45.	Scientific name of quahog clam.	f. hard-shelled clam
h 46.	Beads valued less than wampum.	g. *Pyrula canaliculata*
j 47.	Substance used in aiding the burning out of the inside of a dugout canoe.	h. roenoke
m 48.	Plant sometimes used in poisoning fish.	i. runtees
k 49.	Arrow shafts could be made from this plant.	j. resin
l 50.	Dried and pounded strips of fish used for eating on long journeys.	k. marsh grass
		l. pemmican
		m. buckeye

LIST OF SLIDES

I. Introduction to Unit
Slide #
60. U. S. -region to be studied
61. Tidal river, tidal pools, marsh and forest.
62. Marsh lands
63. Bay, ocean and sandy beach.
64. Chronology chart: Delaware Prehistory

II. Types of Organisms Sought by Primitive Man
(No Slides)

III. Methods of Acquisition
65. Bone fish hooks and shark's tooth.
66. Seine
67. Weir and trap diagram
68. Use of simple spear and atlatl
69. Types of bone harpoons
70. Set-line diagram
71. Net, or fishline, stone sinker
72. Pine float for nets or lines
73. Constructing a dugout canoe
74. John White - a summary of various fishing methods.

IV. Preparation and Preservation of Food
75. Making a stew
76. Broiling a fish
77. An Indian meal
78. Shell midden on ground

V. Use of Marine Fringe Plants as Building Materials
79. A completed thatch house or wickiup.
80. Village of houses made from woven mats.
81. Woven fish basket.

VI. Uses of Shell
82. Whelk drinking cup and ceremonial human skull cup.
83. Scallop dishes
84. Hafted shell celt; shell scraper and hafted whelk hoe.
85. Whelk shell used as hoe.
86. Shell pins
87. Making of shell beads
88. Drilling methods used in making shell beads
89. Various sizes and types of shell beads
90. Various sizes and types of shell beads

91. Shell beads and pendant
92. Pocahantas - display of beadwork.
93. Wampum beads on strings
94. Wampum bead belt
95. Wampum belts were used in Wm. Penn's treaty with the Indians.
96. Shell pendants and gorgets
97. Long-nose god effigy on shell
98. Shell trade items
99. Shell trade items
100. Whelk broken to make drinking cup
101. Whelk shell prepared for bead making
102. Bow drill used in bead making
103. Close-up of bead drilling
104. Bead drilled using bow
105. Bone-handled drill used in bead-making
106. Whelk being made into beads
107. Pendant

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